Human Performance Improvement Overview Training

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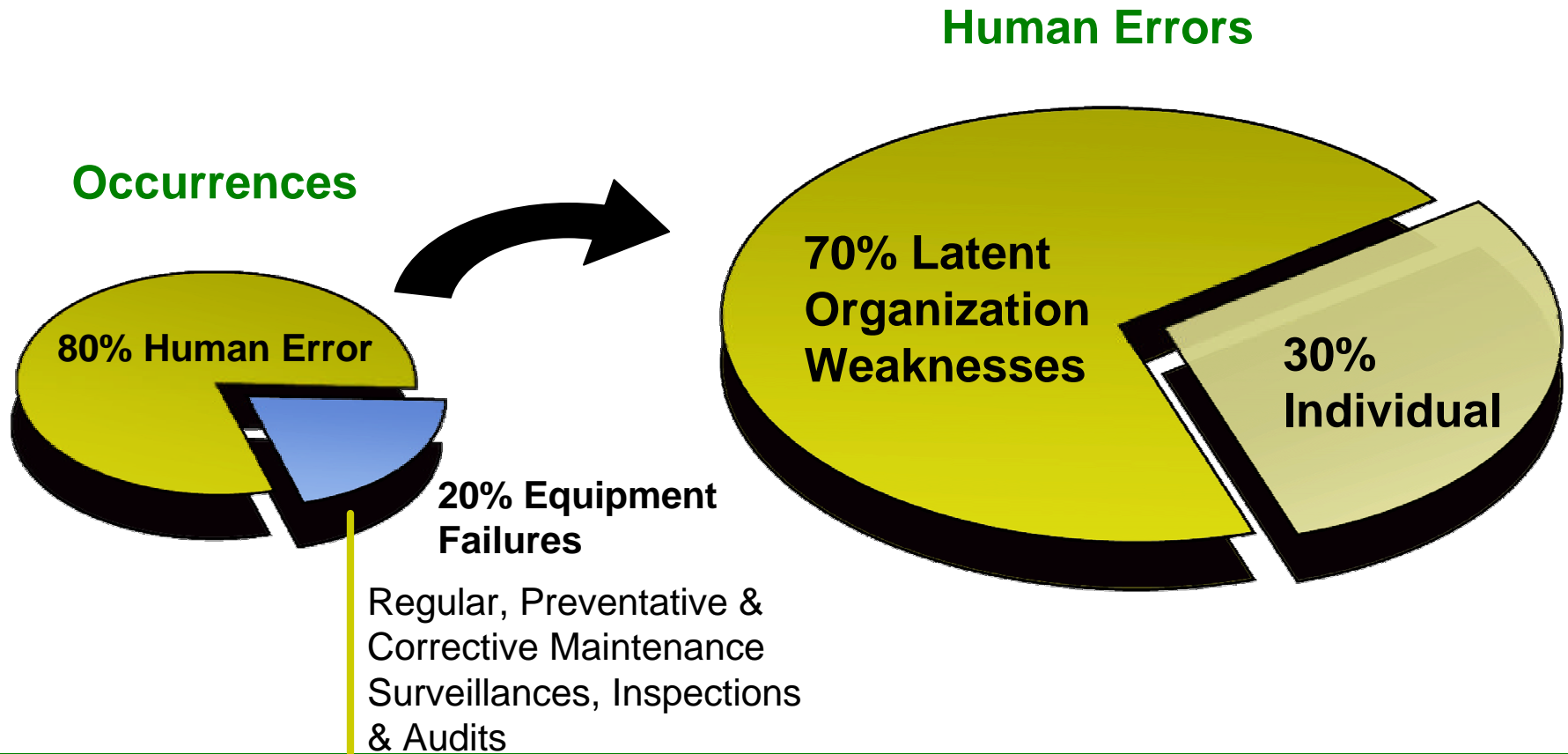
Why a human performance approach?

The Goal of Human Performance is to prevent events that could endanger safety or mission accomplishment

Improving performance in complex, high hazard endeavors requires understanding and managing the complex interactions of people, technology and organizations

Why a Human Performance Approach?

Human Errors

Occurrences

80% Human Error

20% Equipment Failures

Regular, Preventative & Corrective Maintenance Surveillances, Inspections & Audits

70% Latent Organization Weaknesses

30% Individual

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US Nuclear Trends

Rx Trips/ Unit

Significant Events/Unit

Cost (¢/kwh)

Capacity Factor (%)
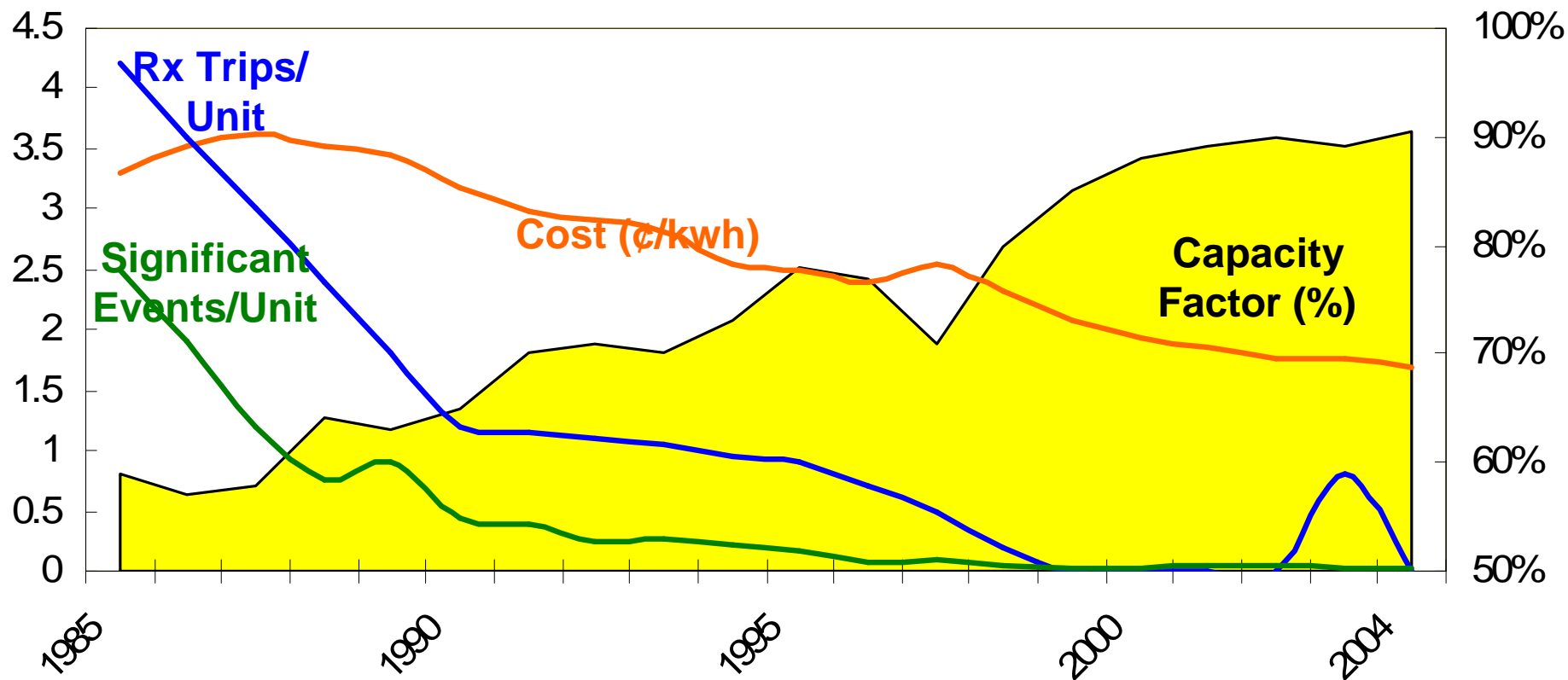
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Human Performance = Behaviors + Results

$$P = B + R$$

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Definition of an Error

An action that unintentionally departs from an expected behavior

Violation

Deliberate, intentional acts to evade a known policy or procedure requirement for personal advantage usually adopted for fun, comfort, expedience, or convenience

Two Views of Human Error

Old View

Human error is the cause of accidents.

To explain failure, you must seek failure.

You must find people's inaccurate assessments, wrong decisions, bad judgments.

New View

Human error is a symptom of trouble deeper inside a system.

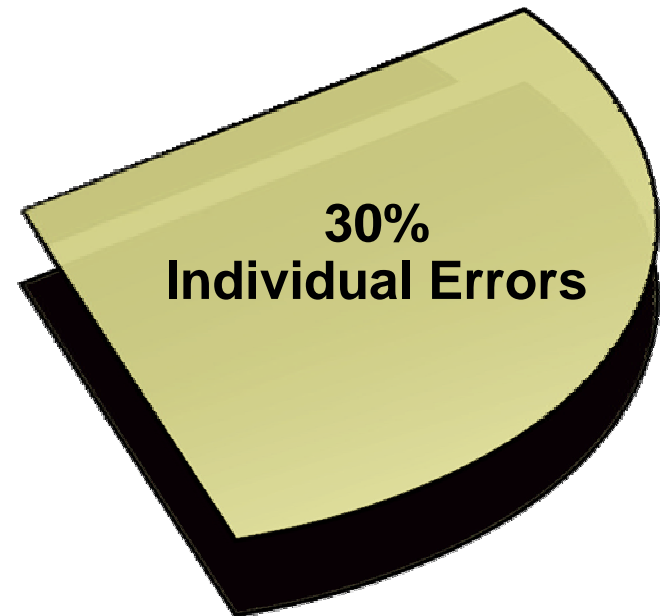To explain failure, do not try to find where people went wrong.

Instead, find how people's assessments and actions made sense at the time, given the circumstances that surround them.

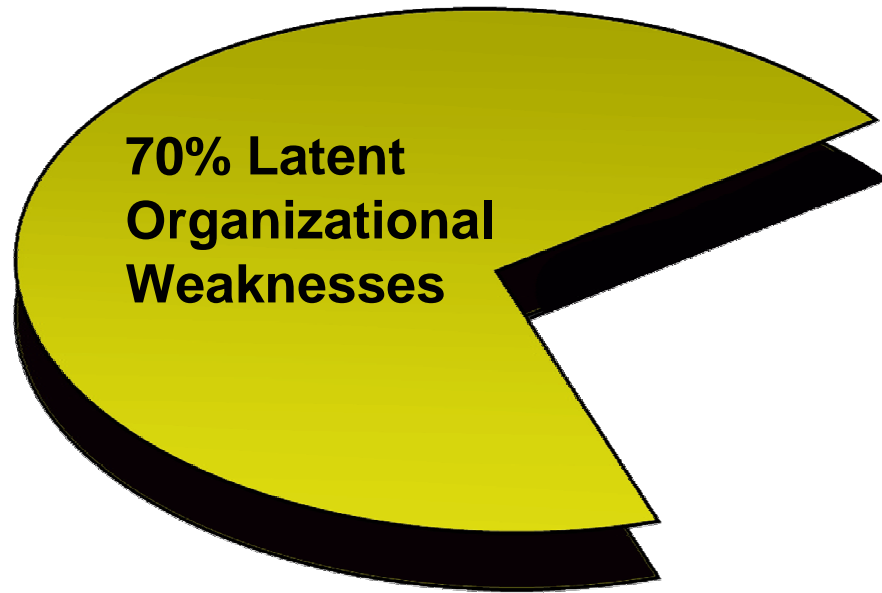Helping the field succeed with safe and reliable operations.

70% Latent Organizational Weaknesses

☐ Facilitate Open Communication

☐ Eliminate Error-likely Situations

☐ Search for and Eliminate Organizational Weaknesses

☐ Reinforce Desired Jobsite Behaviors

A condition that adversely affects, or may adversely affect, DOE or contractor personnel, the public, property, environment or

the DOE mission.

But --- most errors never reach this threshold!

$$Re \ + \ Md \ ? \ \varnothing E$$

[reducing error   AND   managing defenses   leads to   zero events]

Individual   +   organization & processes   >>>> Performance Improvement

**Reducing Errors
Managing Defenses** ▶ **Zero Accidents**
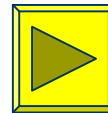
MEDICAL ERRORS AND MISTAKES

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Summary of Human Error

- It abounds in every industry

- It is a major contributor to events and occurrences

- It is costly, adverse to safety and retards productivity

- The greatest cause of human error is weaknesses in the organization not lack of skill or knowledge

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Active
vs.
Latent

An act of omission or commission typically initiated by people at the "sharp end" – those individuals who physically touch the equipment or materials. Often referred to as "the worker".

Undetected deficiencies in processes or values that create work-place conditions that either provoke error or degrade the integrity of defenses.

Defects with administrative or physical defensive measures that, under the right circumstances may fail to:

- Protect plant equipment or people against hazards

- Prevent an occurrence of active errors, or

- Mitigate the consequences of error

Existing conditions that increase

human error rates.
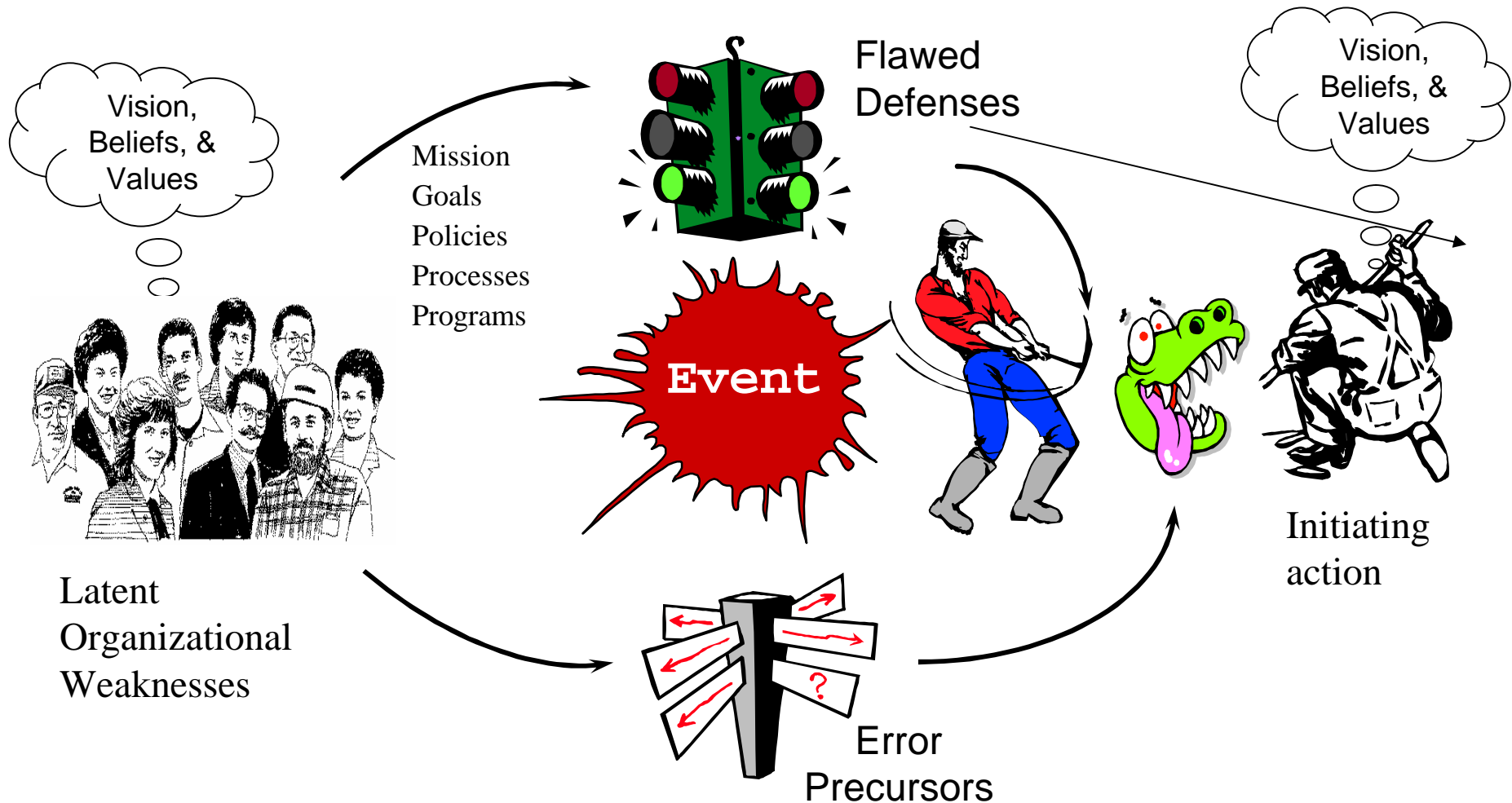
Error Precursors
short list

Task Demands	Individual Capabilities
• Time pressure (in a hurry)	• Unfamiliarity w/ task / First time
• High Workload (memory requirements)	• Lack of knowledge (mental model)
• Simultaneous, multiple tasks	• New technique not used before
• Repetitive actions, monotonous	• Imprecise communication habits
• Irrecoverable acts	• Lack of proficiency / Inexperience
• Interpretation requirements	• Indistinct problem-solving skills
• Unclear goals, roles, & responsibilities	• "Hazardous" attitude for critical task
• Lack of or unclear standards	• Illness / Fatigue
• Distractions / Interruptions	• Stress (limits attention)
• Changes / Departures from routine	• Habit patterns
• Confusing displays or controls	• Assumptions (inaccurate mental picture)
• Workarounds / OOS instruments	• Complacency / Overconfidence
• Hidden system response	• Mindset ("tuned" to see)
• Unexpected equipment conditions	• Inaccurate risk perception (Pollyanna)
• Lack of alternative indication	• Mental shortcuts (biases)
• Personality conflicts	• Limited short-term memory

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Anatomy of an Event

Vision, Beliefs, & Values

Mission
Goals
Policies
Processes
Programs

Flawed Defenses

Event

Vision, Beliefs, & Values

Initiating action

Latent Organizational Weaknesses

Error Precursors

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Human Performance Principles

1. People are fallible, and even the best make mistakes.

2. Error-likely situations are predictable, manageable, and preventable.

3. Individual behavior is influenced by organizational processes and values.

4. People achieve high levels of performance based largely on the encouragement and reinforcement received from leaders, peers, and subordinates.

5. Events can be avoided by understanding the reasons mistakes occur and applying the lessons learned from past events.

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Video
Human Errors

Constant Sorrow

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Human Fallibility
vs.
Vulnerability

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Anatomy of an Event

Flawed Defenses

Vision, Beliefs, & Values

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Event

Latent Organizational Weaknesses

Initiating Action

Error Precursors

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- ☐ <u>Stress</u>

- ☐ Avoidance of <u>mental strain</u>

- ☐ Inaccurate <u>mental models</u>

- ☐ Limited working <u>memory</u>

- ☐ Limited <u>attention</u> resources

- ☐ Mind <u>set</u>

❑ Difficulty <u>seeing</u> own errors

❑ Limited <u>perspective</u>

❑ Susceptible to <u>emotion</u>

❑ Focus on <u>goal</u>

❑ <u>Fatigue</u>

Hazardous Attitudes

- **Pride** "Don't insult my intelligence."

- **Heroic** "I'll get it done, hook or by crook."

- **Invulnerable** "That can't happen to me."

- **Fatalistic** "What's the use?"

- **Bald Tire** "Got 60K miles and haven't had a flat yet."

- **Summit Fever** "We're almost done."

- **Pollyanna** "Nothing bad will happen."

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Performance Modes — Attending Problems
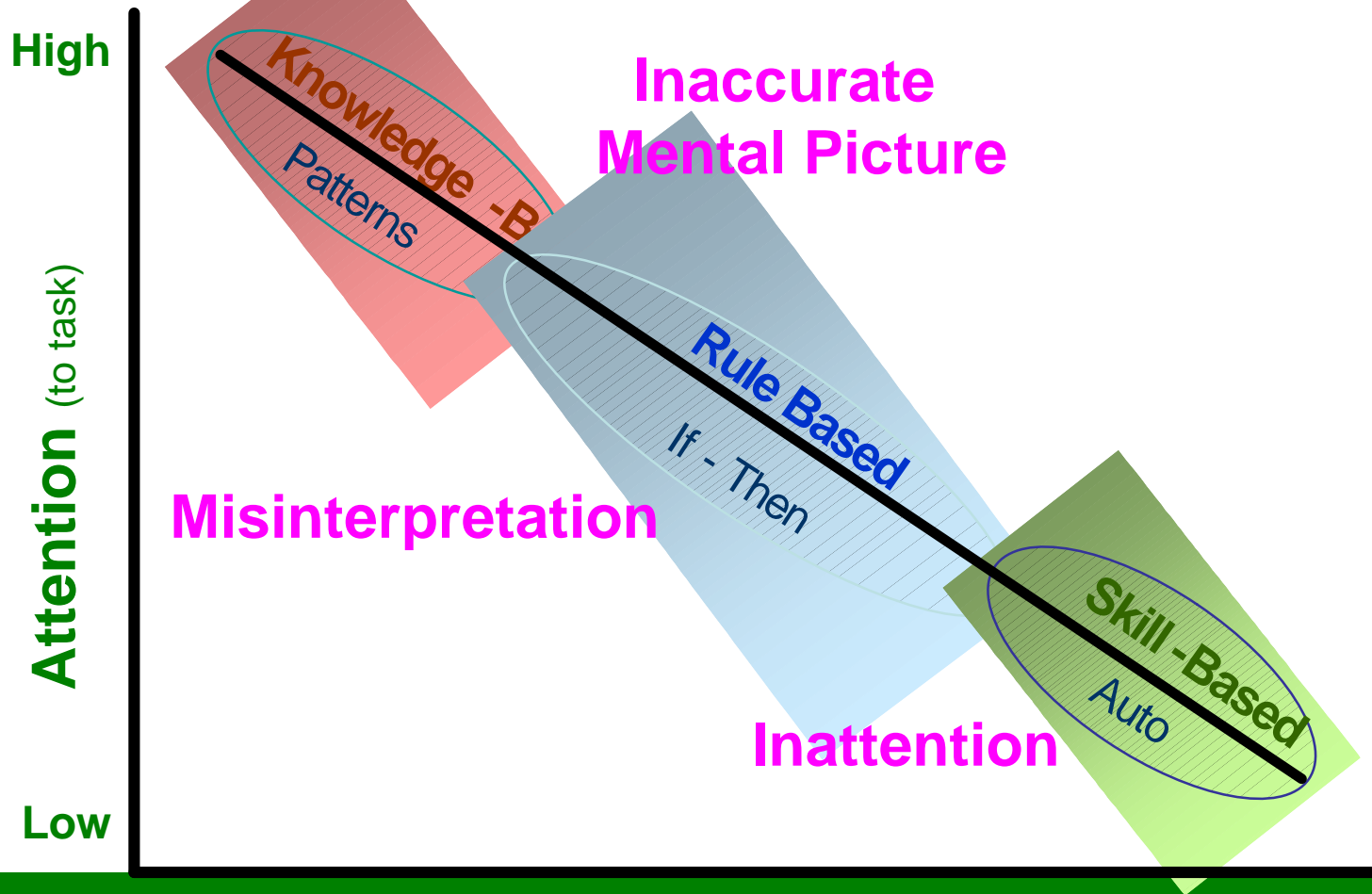
Source: James Reason. *Managing the Risks of Organizational Accidents*, 1998.

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Anatomy of an Event

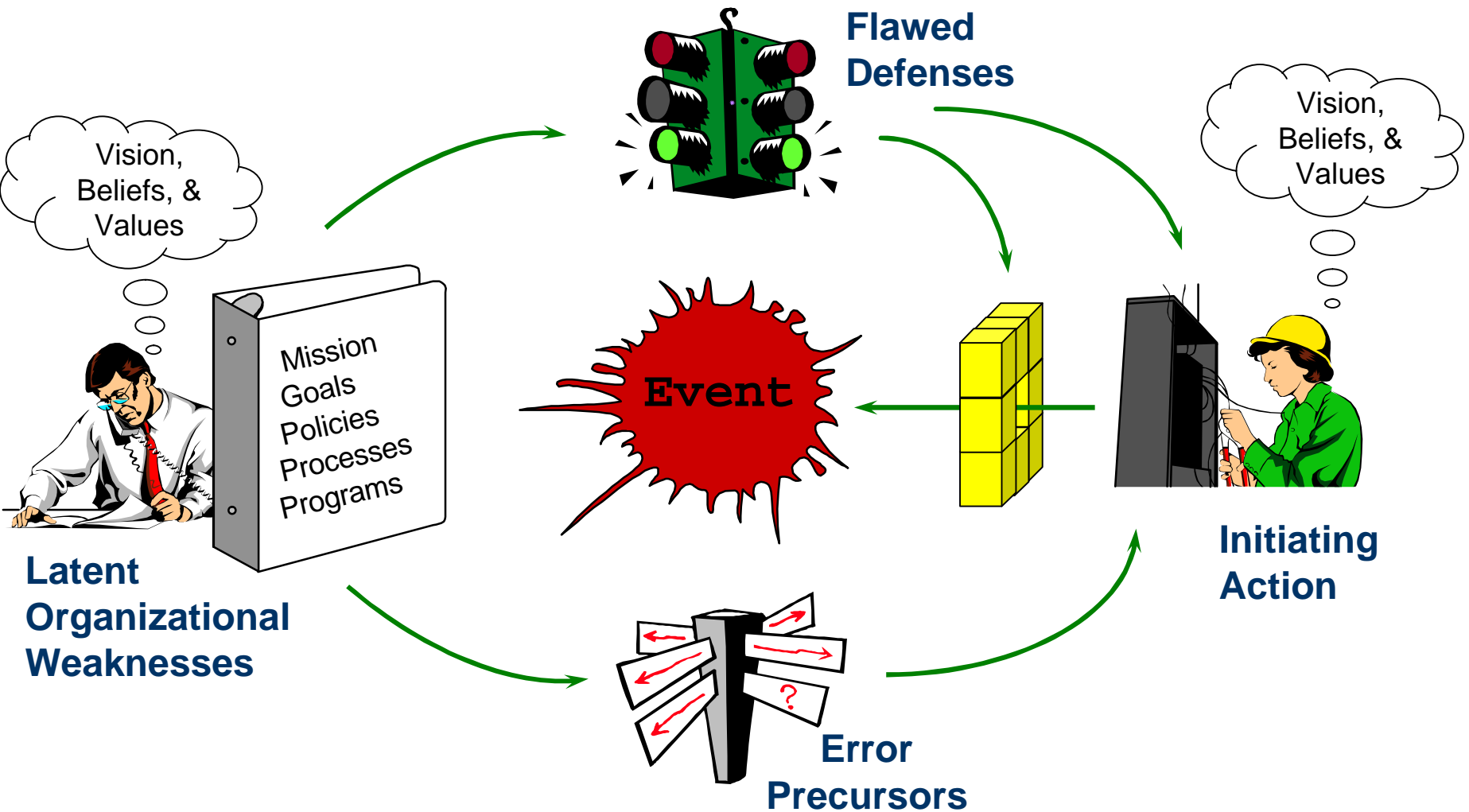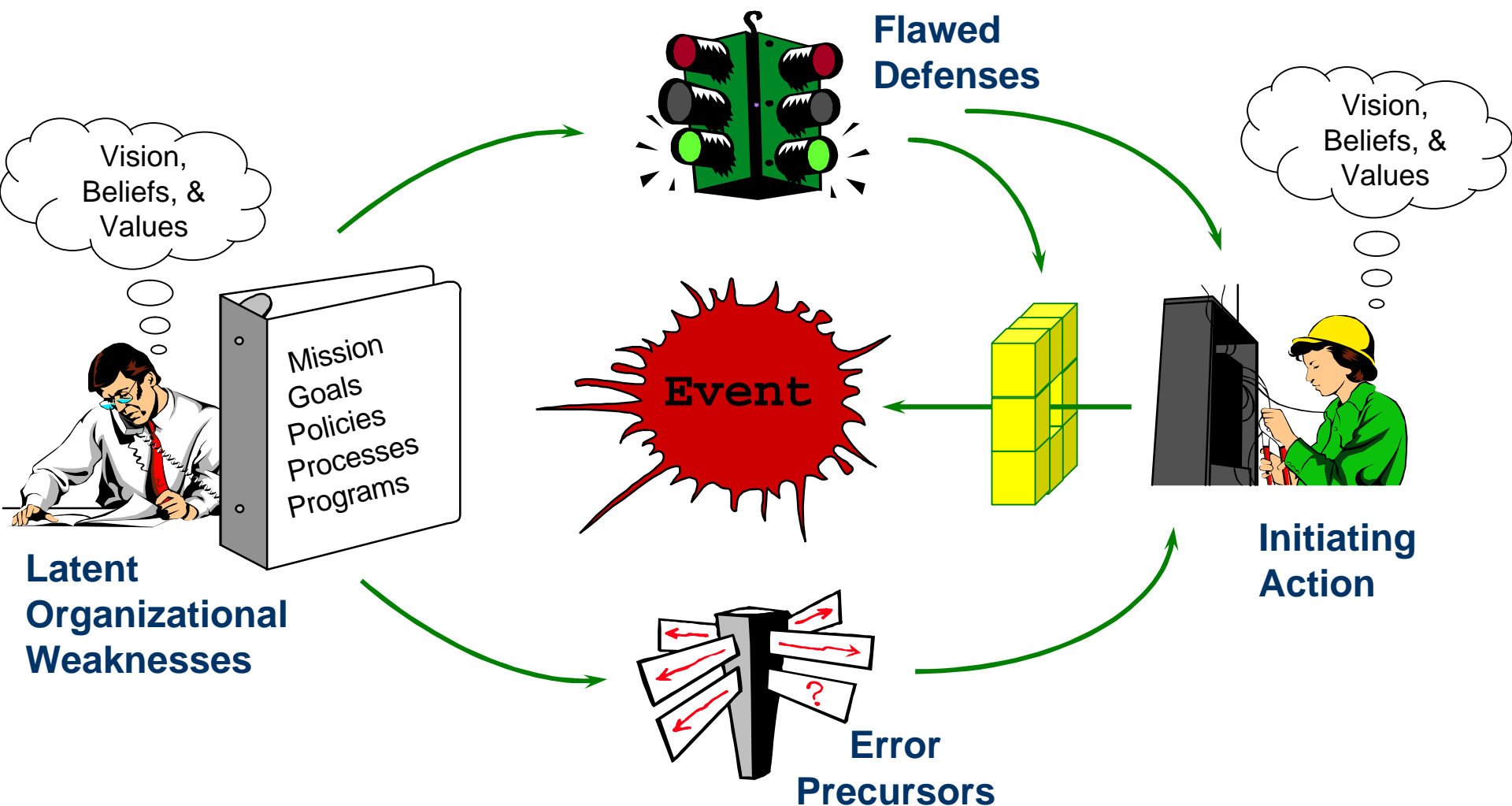Helping the field succeed with safe and reliable operations.

Error-likely Situation
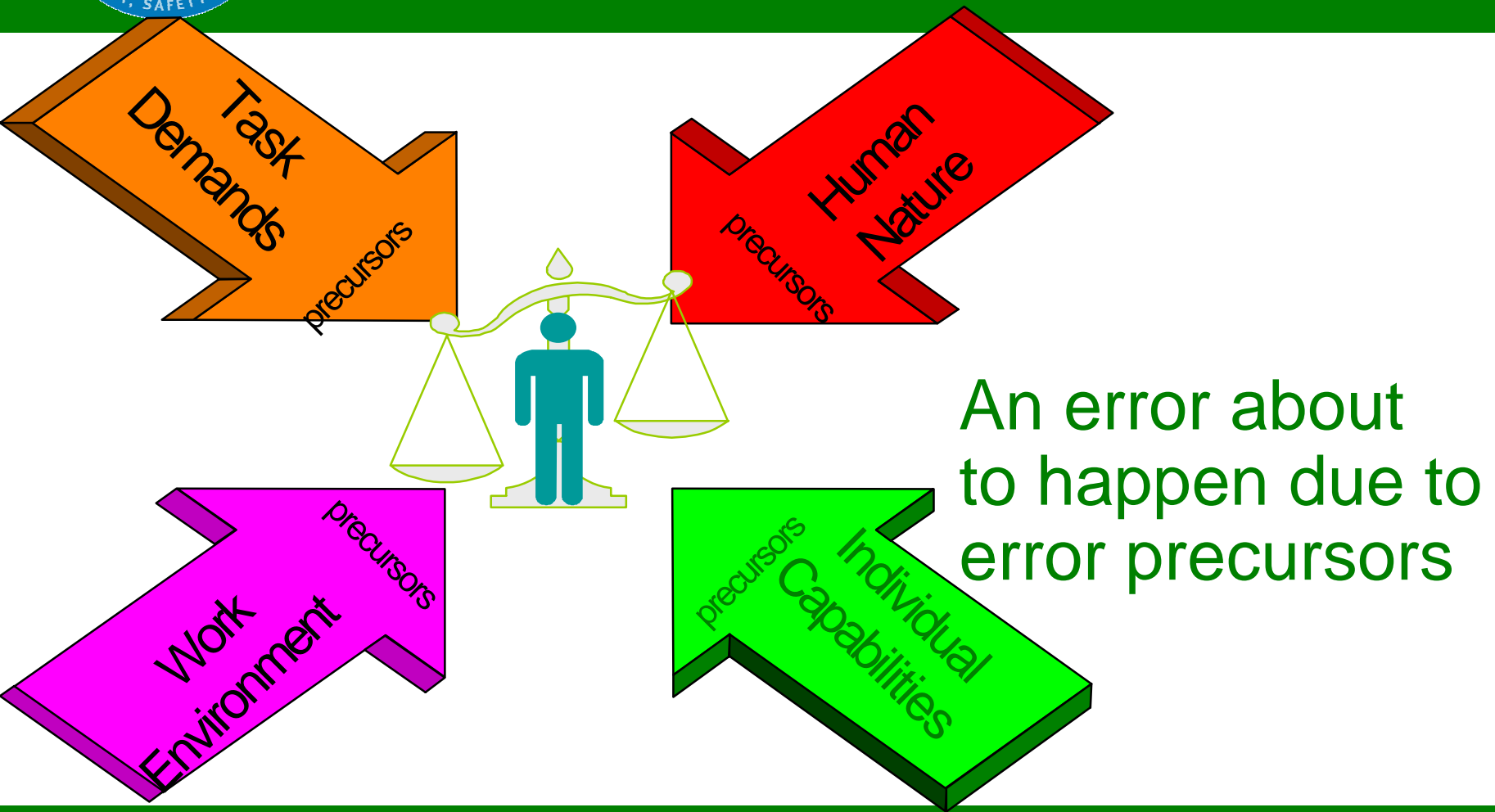
Task Demands precursors

Human Nature precursors

Work Environment precursors

Individual Capabilities precursors

An error about to happen due to error precursors

Processes (structure)

- ☐ Work Control

- ☐ Training

- ☐ Accountability Policy

- ☐ Reviews & Approvals

- ☐ Equipment Design

- ☐ Procedure Development

- ☐ Human Resources

Values (relationships)

- ☐ Priorities

- ☐ Measures & Controls

- ☐ Critical incidents

- ☐ Coaching & Teamwork

- ☐ Rewards & Sanctions

- ☐ Reinforcement

- ☐ Promotions & Terminations

- ✓ **Self-checking**

- ✓ **Peer-checking**

- ✓ **Concurrent verification**

- ✓ **Independent verification**

- ✓ **STAR**

- ✓ **Three-way communication**

- ✓ **Meetings**

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- ✓ **Placekeeping**

- ✓ **Prejob Briefing**

- ✓ **Problem-solving**

- ✓ **Procedure use & adherence**

- ✓ **Questioning attitude**

- ✓ **Situational awareness**

- ✓ **Stop & collaborate**

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- ❑ Self-Assessment
- ❑ Benchmarking
- ❑ Postjob Critique
- ❑ Trending
- ❑ Surveys and Questionnaires
- ❑ Observation

Managers

- ❑ **Foster a culture that values prevention of events**

- ❑ **Strengthen the integrity of defenses**

- ❑ **Preclude the development of error-likely situations**

- ❑ **Create a learning environment that promotes continuous improvement**

- ❑ **INPO- Excellence in Human Performance**

Human Performance Improvement (HPI)

The Leader's Role

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Who is a Leader?

Supervisors and Managers
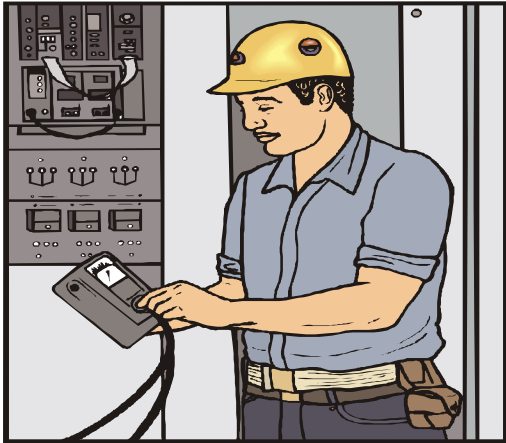
Front Line Workers
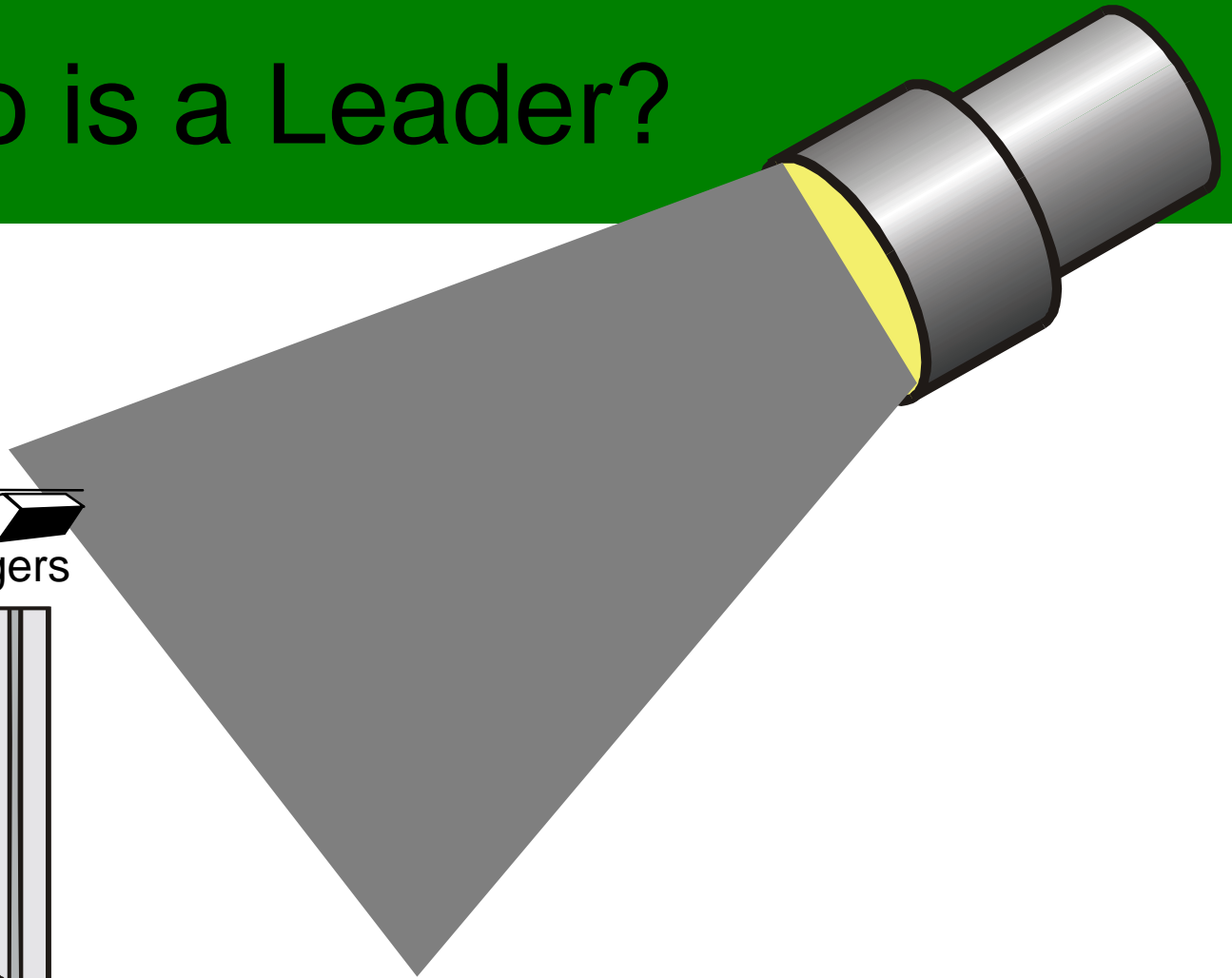
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Leader Defined

Any individual who takes personal responsibility for his or her performance and the plant's performance and attempts to influence the improvement of organizational processes and values.
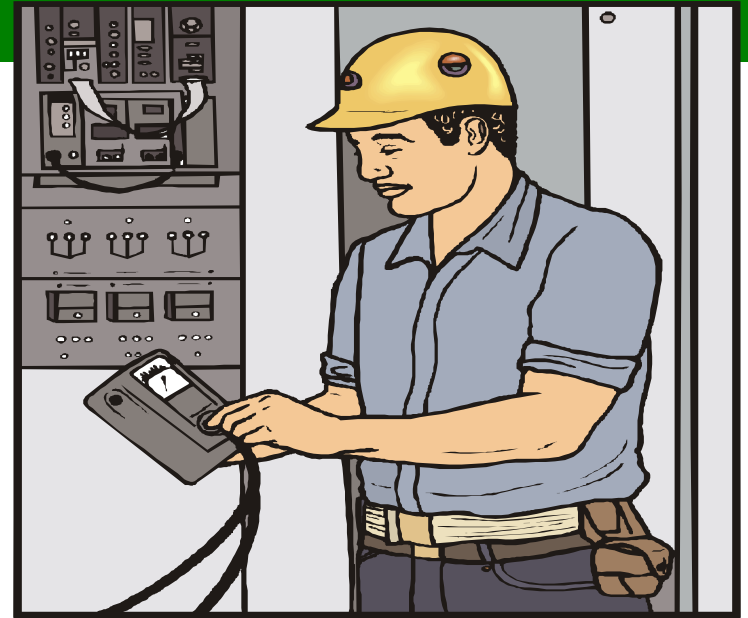
Leaders influence other through relationships characterized with respect, honesty, and fairness. When perceived as successful, they provide a positive peer pressure.

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Leaders Role.

To align organization processes and values to optimize individual performance at the job site.

What type of individuals do we need as leaders?

Leadership

Job Site Conditions

Worker Behaviors

Org'l Processes & Values

Physical Plant Results
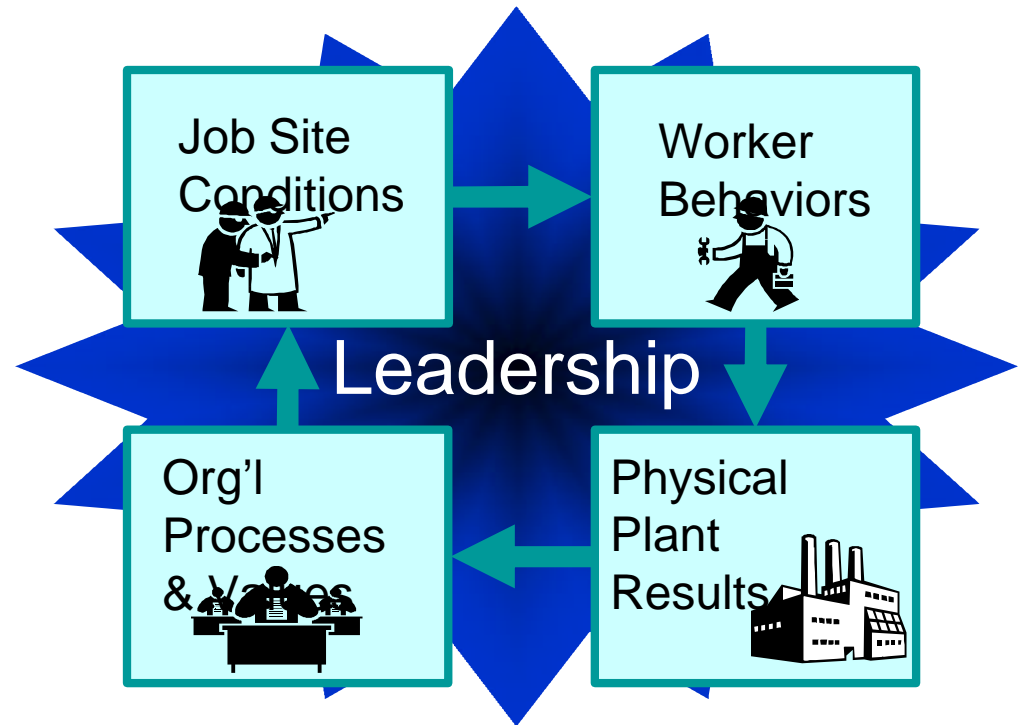
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Performance Model
(Where does the leader fit in?)

Job Site Conditions

- *Task Information*
- *Resources*
- *Incentives*
- *Knowledge*
- *Readiness*
- *Motives*

Worker Behaviors

- *Preferred*
- *At-risk*
- *Error*
- *Violation (short cuts)*
- *Personal consequences*

Org'l Processes & Values

- *Mission & Goals*
- *Business Plans*
- *Programs & Policies*
- *Work Processes*
- *Roles & Relationships*
- *Values & Beliefs*

Physical Results at Facility

- *Indicators*
- *Efficiencies*
- *Equipment Performance & Materiel Condition*
- *Configuration*
- *Transients*

Source: Rummler and Brache. *Improving Performance*, 1990.

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Strategic Framework
for Human Performance
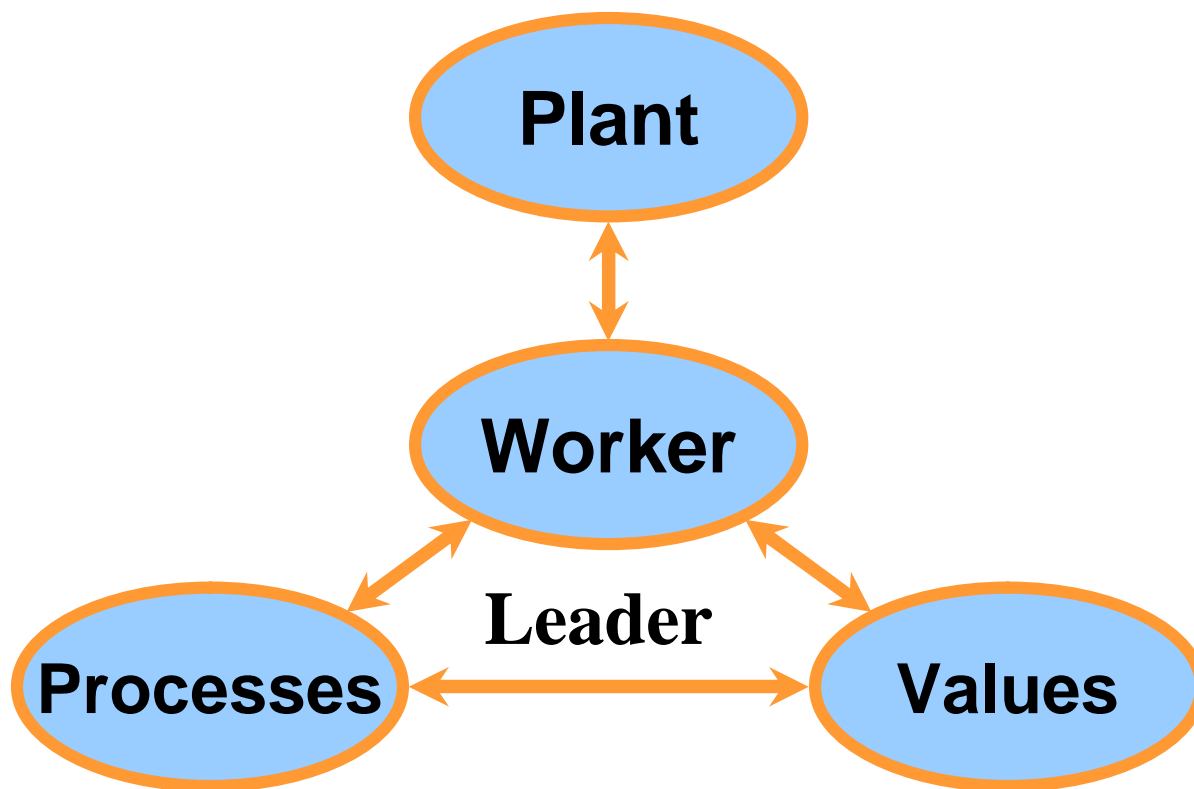
Plant

Worker

Leader

Processes

Values

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- Commitment

- Competence

- Cognizance

the 3 "Cs"

James Reason. Managing the Risks of Organizational Accidents, p 113.

Leader Behaviors

1. Facilitate open communication

2. Promote teamwork

3. Eliminate latent organizational weaknesses

4 Reinforce desired behaviors

5. Value prevention of errors

Managers:

"Ask for what <u>you need</u> to <u>hear</u>, not for what you want to hear."

Subordinates:

"Tell what <u>they need</u> to hear, not what you want to tell them."

Roger Boisjoly

Former chief engineer for Morton-Thiokol, Inc.

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The Blame Game
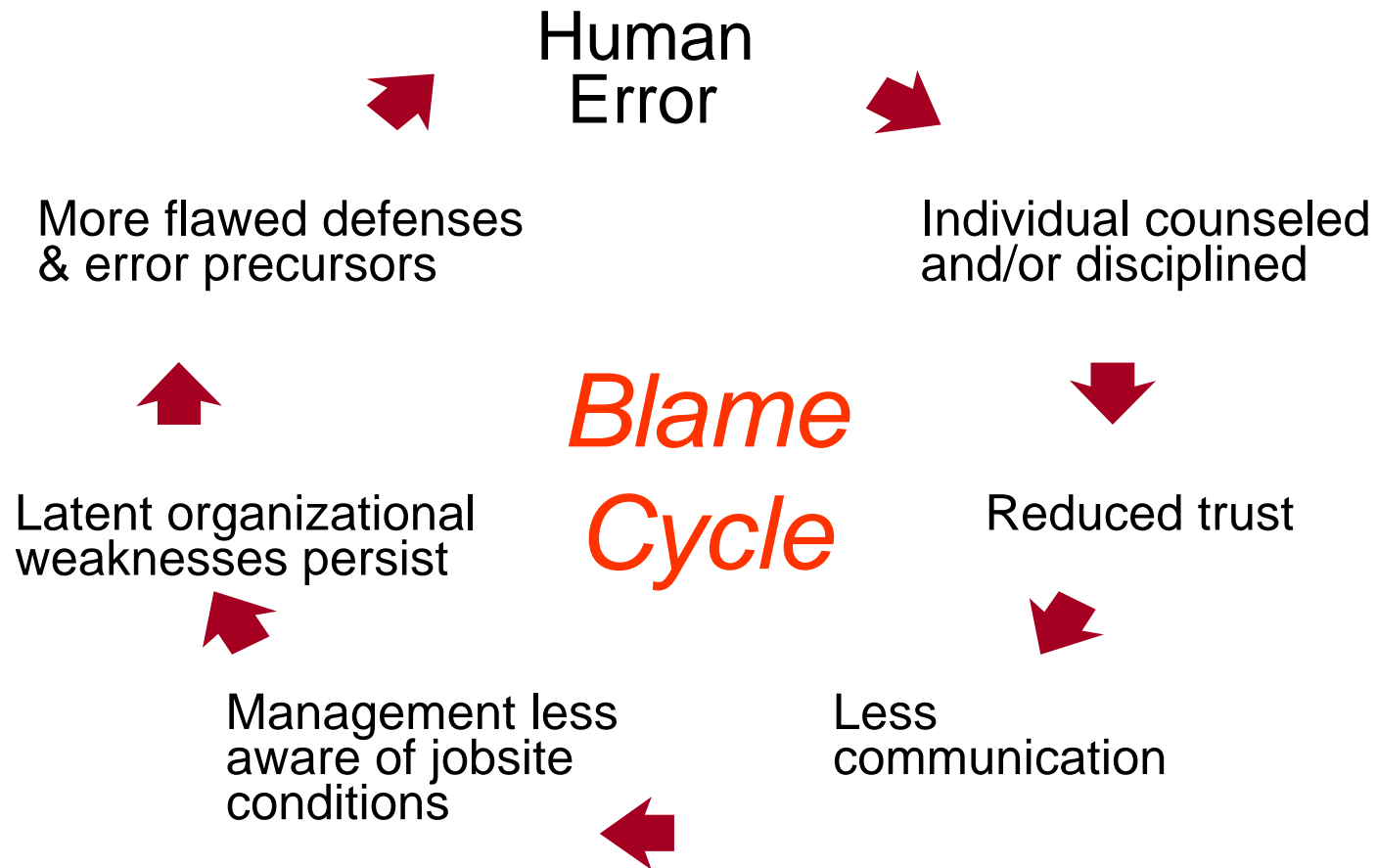
Human
Error

More flawed defenses
& error precursors

Individual counseled
and/or disciplined

*Blame
Cycle*

Latent organizational
weaknesses persist

Reduced trust

Management less
aware of jobsite
conditions

Less
communication

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If the workforce believes errors will be punished, then information related to errors in the plant will likely remain unknown.

However, if a "just" environment exists, the likelihood of reporting will increase.

People want to be treated fairly, honestly, and with respect, and they want the same for others. High-reliability organizations do not punish employees for making mistakes when they are trying to do the right thing.

Remember, error is not sin and that discipline or punishment does not influence future fallibility, but it should be used as a tool for behavior change if the person acted purposely, knowingly, and recklessly.

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Culpability Decision Tree

Were the actions as intended? — NO → Unauthorized substance? — NO → Knowingly violate safe operating procedures? — NO → Pass substitution test? — YES → History of unsafe acts?

Were the actions as intended? — YES → Were the consequences as intended?

Were the consequences as intended? — YES → Sabotage, malevolent damage, suicide, etc.

Unauthorized substance? — YES → Medical condition?

Medical condition? — NO → Substance abuse without mitigation

Medical condition? — YES → Substance abuse with mitigation

Knowingly violate safe operating procedures? — YES → Were procedures available, workable, intelligible, and correct?

Were procedures available, workable, intelligible, and correct? — YES → Possible reckless violation

Were procedures available, workable, intelligible, and correct? — NO → System induced violation

Pass substitution test? — NO → Deficiencies in training & selection or inexperience?

Deficiencies in training & selection or inexperience? — NO → Possible negligent error

Deficiencies in training & selection or inexperience? — YES → System induced error

History of unsafe acts? — YES → Blameless error but corrective training or counseling indicated

History of unsafe acts? — NO → Blameless error

Diminishing culpability

Source: Reason, *Managing the Risks of Organizational Accidents*, Ashgate. 1998. (see pgs 208-209)

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Promote Teamwork

• Explore tasks to identify potential error-likely situations

•Reinforce uniform adherence to high standards

•Confirm that workers accurately perceive the potential consequence of unsafe behavior

•Resolve conflicts between individuals or among work groups

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Promote Teamwork

- Verify that individuals possess capabilities to achieve task requirements

- Minimize unfamiliarity among members of an operating crew or work team

- Compensate for weaknesses in supervision, training or procedures before conducting work

Specific Leader Behaviors:

- Solicit and act on feedback from workers about problems that may lead to error.

- Determine fundamental causes of performance problems.

- Monitor trends in plant and human performance

Reinforce Desired Behaviors

Specific Leader Behaviors:

• Specify behaviors important for task success.

• Reinforce desired individual behaviors

• Monitor and coach workers through firsthand observation, active listening, and questioning.

• Stop unsafe behavior

• Participate in training program activities

•There is a direct cause-effect relationship between a manager's actions and an employee's behavior.

•Managers can take specific actions to reliably improve performance for the long term by controlling consequences.

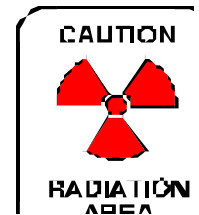•It is consequences, not directives or threats that reinforce behavior.

Value Prevention of Errors

Specific Leader Behaviors:

•**Promote safety** as the overriding priority.

•**Encourage candid acknowledgemen**t of personal limitations.

•**Assign individuals** to tasks using established criteria.

•**Incorporate defensive measures** into tasks important for nuclear safety to accommodate organization wide distractions in the workforce.

•**Monitor and modify their own behaviors**.

Manager Behaviors that influence values of the organization

- What they pay attention to, measure and control
- Reactions to incidents or crises
- Criteria used to allocate resources
- Deliberate attempts at role modeling, teaching & coaching
- Criteria used for reinforcement & discipline
- Criteria used to select, promote and terminate employees

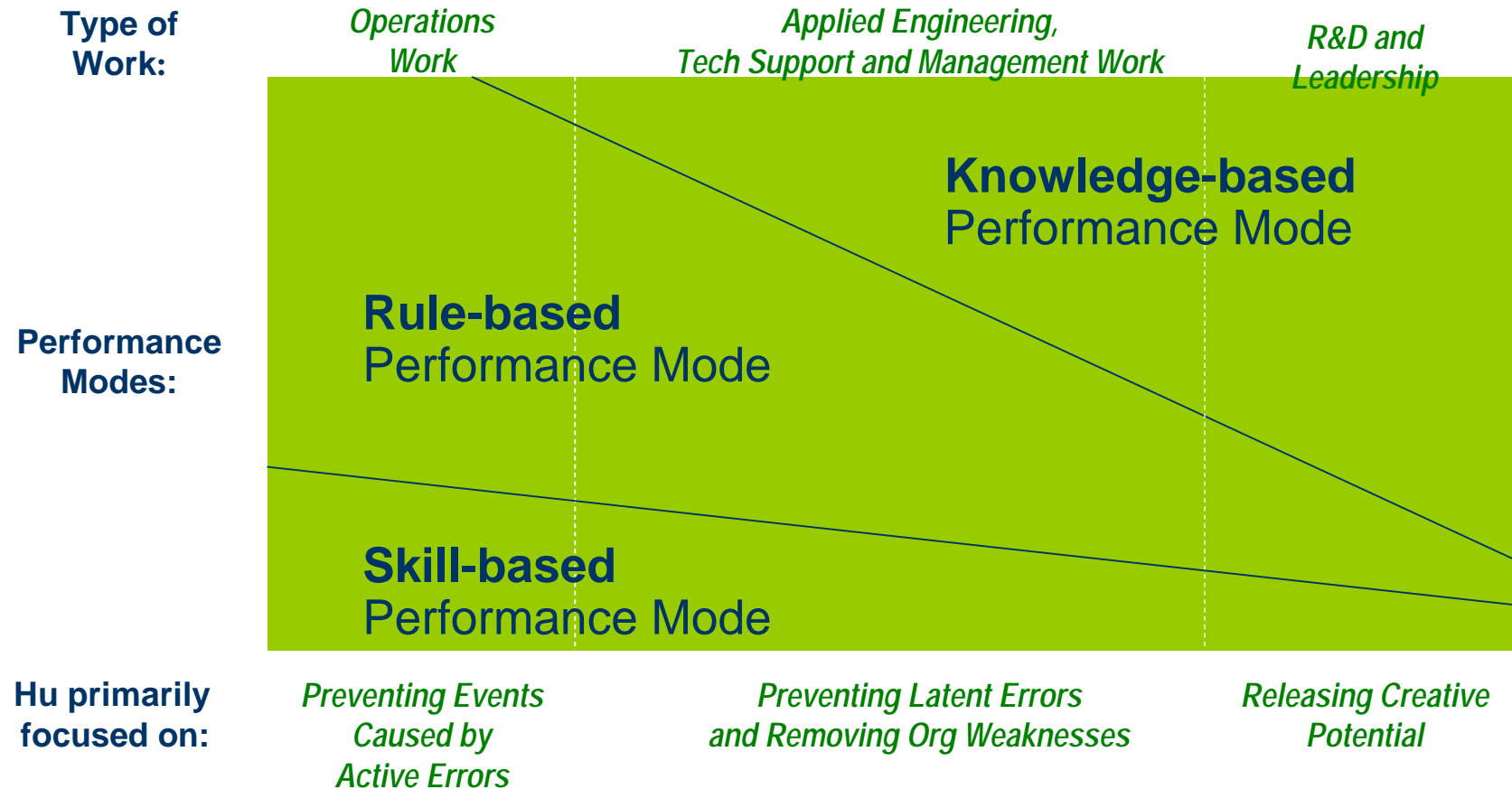Helping the field succeed with safe and reliable operations.

Primary Mission is
Fuels and Material Testing for the
Naval Nuclear Propulsion Program.

- TRA had approximately <u>12 occurrence reports in 2002</u> that had human error as a contributing cause (ie: Inattention to detail, Not following procedures, Worker error).

- TRA Management formed a group to review the general error precursors related to these events and identify the contributing organizational weaknesses.

- Utilizing human performance principles, TRA experienced <u>only 2 events in 2003</u> where human error was identified as the
root cause.

- In 2004, reached 1 million man hours without a lost time work accident

- 2004 one recordable injury (11/04),
Zero Lost Time

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Type of Work:

| Operations Work | Applied Engineering, Tech Support and Management Work | R&D and Leadership |

Performance Modes:

Knowledge-based Performance Mode

Rule-based Performance Mode

Skill-based Performance Mode

Hu primarily focused on:

| Preventing Events Caused by Active Errors | Preventing Latent Errors and Removing Org Weaknesses | Releasing Creative Potential |

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Hu Focus as a Function of Type of Work (Explained per the Performance Modes) — Non-Nuc

Type of Work: *Operations Work*   *Applied Engineering, Tech Support and Management Work*   *R&D and Leadership*

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Rule-based Performance Mode

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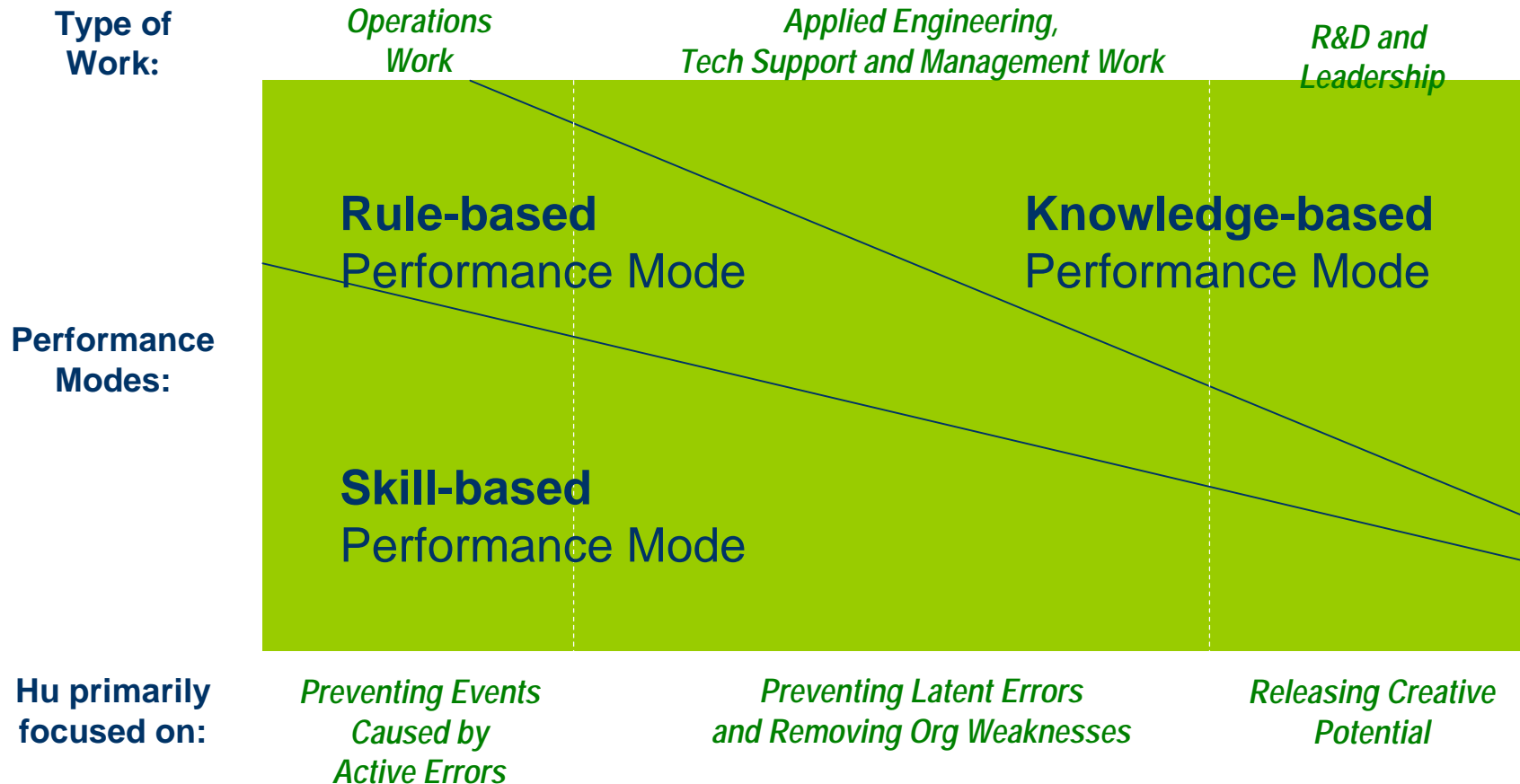
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Indicators of Early Success

- ❑ Identification of latent organizational weaknesses

- ❑ Increase in uneasiness

- ❑ Workers identifying latent conditions

- ❑ Utilization of the new Occurrence Guide 231.1-2

- ❑ Recognition of the development of a "Just" culture

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Questions?